USGS

Africa Physical and Cultural Geography Project: Activity 4 -- Plate Boundaries, Earthquakes and Volcanoes

The Earth is formed of several layers that have very different physical and chemical properties. The outer layer, which averages about 70 kilometers in thickness, consists of about a dozen large, irregularly shaped plates that slide over, under and past each other on top of the partly molten inner layer. Most earthquakes occur at the boundaries where the plates meet. In fact, the locations of earthquakes and the kinds of ruptures they produce help scientists define the plate boundaries.
http://pubs.usgs.gov/gip/earthq1/

In this exercise, you will examine the location and patterns of plate boundaries, earthquakes, and volcanoes for the world. You will add the continents, plate boundaries, earthquakes, and volcanoes to a view. You will also change the symbols representing these features.

ArcView Steps

Step 1 Start ArcView and start a project

Open ArcView GIS by accessing:
ESRI

ArcView 

Choose the project that you have been working on:
In the Student temporary folder, look for the file "your team name.apr".

Step 2 Add a View to the project

Add a view by clicking on the Views icon  and the New button 

in the project (currently Untitled) window.

Step 3 Rename the View

Choose Properties from the View pulldown menu, and rename the view to "Plate Boundaries, Earthquakes and Volcanoes".
Select "decimal degrees" from the Map Units pull down list.
Select "kilometers" from the Distance Units pull down list.
Click on Projection and check to make sure the Category is "Projections of the World".
Check to make sure the Type is "Geographic"--you should not need to change these two selections. Click OK.

Step 4 Set the Working Directory

In this activity, you will be creating new files. You will want to save your work to a directory on your hard drive.

To change the default directory, click File and choose Set Working Directory from the pulldown menu. Type the path to the directory where you will save your work.
This should be the "student temporary" directory, then click OK.

Step 5 Save the project

Make the project (currently Untitled) window active.
From the File pulldown menu, choose Save Project As.
Save the project as "your team name.apr" in your working directory.

Step 6 Add Continents, Plate Boundaries, Earthquakes and Volcanoes to the view

Click the Add Theme  button.
In the Add Theme Dialog box, navigate to the BHS PowerMac --> ESRI --> ESRIDATA --> AFRICA directory.
The earthquakes.shp file contains earthquakes greater than or equal to magnitude 6.5.
The volcanoes.shp file contains active and inactive volcanoes.
Hold down the Apple or Star key and click on earthquakes.shp and volcanoes.shp.
OK to add these themes to the view.

Click the Add Theme  button again.
In the Add Theme Dialog box, navigate to the BHS PowerMac --> ESRI --> ESRIDATA --> AFRICA directory.

plates.shp file = plate boundaries for the world.
continent.shp file = contains outlines for the continents.

Click on plates.shp and hold down the Apple or Star key and click on the continent.shp to add these themes to the view.

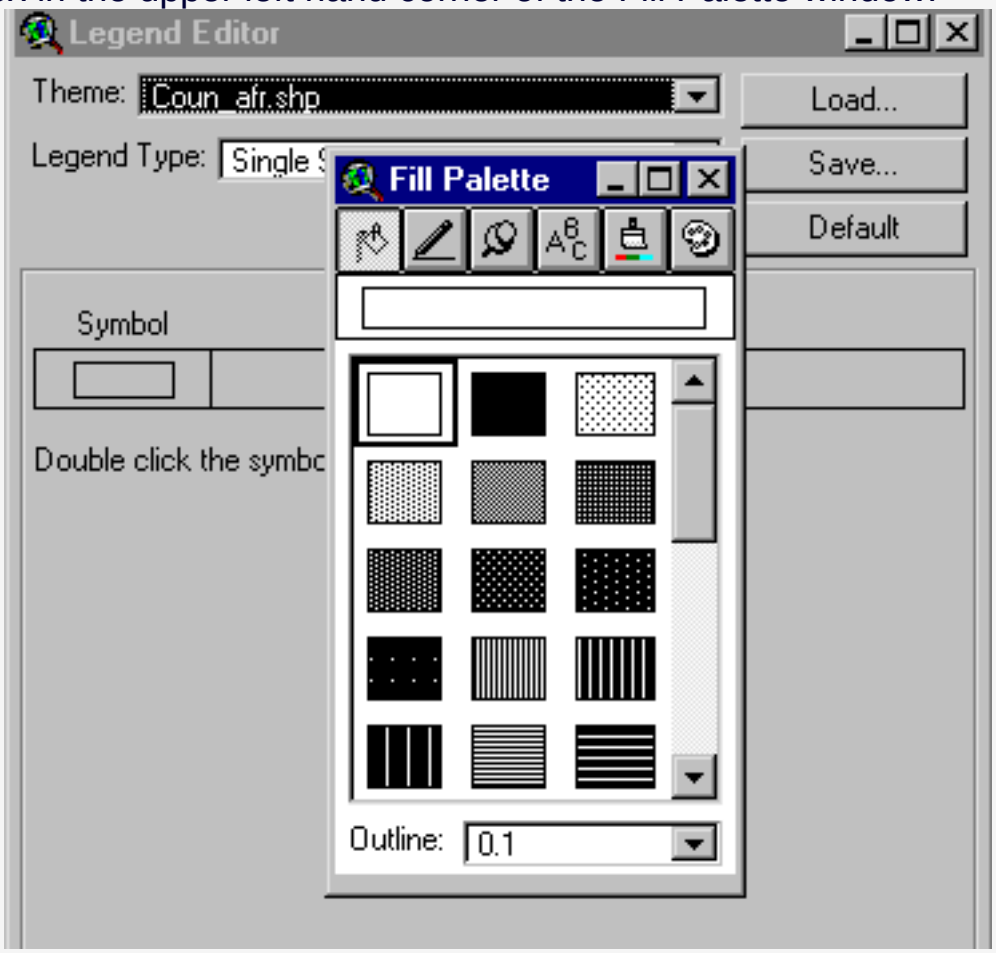
Step 7 Rename the themes

The earthquakes.shp, continent.shp, and plates.shp themes appear in the view's table of contents. Make the earthquakes.shp theme active by clicking on its name (i.e., its name appears raised).
Choose Properties from the Theme pulldown menu.
Rename earthquakes.shp to Earthquakes.
Click OK.

Follow the same procedure to rename the volcanoes.shp theme to Volcanoes.
Rename the the Plates.shp theme to Plate Boundaries.
Rename the Continent.shp to Continents.

Step 8 Make the Continents fill pattern transparent

To make the continents shape transparent, double-click on the theme's name to bring up the Legend Editor.
Double-click on the colored box below Symbol to bring up the Fill Palette.
Click on the blank box in the upper left hand corner of the Fill Palette window.
Leave the Legend Editor open.



Step 9 Change the size and color of symbol for the Earthquakes theme

Double-click on the Earthquakes theme and click on the thumbtack icon to bring up the Marker Palette  .
Symbolize the earthquakes with blue circles.
In the Marker Palette window change the size to 8.
Click on the paintbrush icon to bring up the Color Palette  .
From the Color Palette choose a bright blue color.
Click Apply in the Legend Editor to apply your changes to the view.
Leave the Legend Editor open.

Step 10

Change the size, color and type of symbol for the Volcanoes theme

Double-click on the Volcanoes theme and click on the thumbtack icon to bring up the Marker Palette  .
Symbolize the volcanoes with red triangles.
In the Marker Palette window change the symbol to a triangle and the size to 8.
Click on the paintbrush icon to bring up the Color Palette  .
From the Color Palette choose a red color.
Click Apply in the Legend Editor to apply your changes to the view.
Leave the Legend Editor open.

Step 11

Change the size and color of symbol for the Plate Boundaries theme

Double-click on the Plate Boundaries theme and click on the pencil icon to bring up the Pen Palette  .
Symbolize the plate boundaries with a brown-colored thick line.
In the Pen Palette window change the size to 2.
Click on the paintbrush icon to bring up the Color Palette  .
From the Color Palette choose a blue color.
Click Apply in the Legend Editor to apply your changes to the view.
Leave the Legend Editor open.

Step 12

Arrange the Themes in the View window

Arrange the themes in your view window in the following order:

- Plate Boundaries
- Volcanoes
- Earthquakes
- Continents

You can change the order of the themes by dragging a theme. This is accomplished by clicking on the theme and holding down the mouse and dragging the box that appears until the theme is in the proper order.

Step 13 Display the Themes in the View

Click on the raised box to the left of the Theme names to make a check mark and see the coverages displayed in the View window. You may want to turn the volcanoes theme off to view the earthquakes and then turn the earthquakes theme off to view the volcanoes. You may need to maximize or resize the ArcView window and the View window to see the entire view.

Step 14 Query a Particular Point in the View

Make the Earthquakes theme active by clicking on its name. Click on the Information button  to find out information about some of the volcanoes in Africa.

Step 15 Open the theme table and sort on a particular field

Make the Earthquakes theme active by clicking on its name.
Open the Earthquakes theme table by clicking the Open Theme Table Button  .
When the table opens, widen the window until the Magnitude column is displayed.
Select this field by clicking on the field name "Magnitude".
Click on the Sort Descending button to sort the records by Magnitudes from largest to smallest. You can also sort the records on any of the other fields in the table in descending or ascending order.

Click on one of the fields in the first record or line of data. The corresponding point should be highlighted in yellow in the view window. To highlight several earthquakes, hold down the Apple or Star key and select all the records with magnitudes of 8.7 to 8.9.
Click on the Unselect all records button to deselect the records. Close the Earthquakes theme table.

Step 16 Save the project again

Make the project YourTeamName.apr window active.
From the File pulldown menu, choose Save Project.

Questions

Note: You may want to turn the volcanoes theme off to view the earthquakes. Then turn the volcanoes theme on and turn the earthquakes theme off to view the volcanoes.

Question 1 — Where are the majority of the earthquakes in the world located in relationship to the plate boundaries? Why?

Question 2 — Where are most of the earthquakes in Africa located in relationship to the plate boundaries?

Question 3 — A rift zone is where a continent is believed to be spreading apart, but not on a plate boundary. A rift zone causes magma to rise to the surface and erupt in a line of volcanoes. Based on this information, in what African countries is the rift zone located?

Question 4 Compare the location of the plate boundaries and earthquakes along the coast of Africa and along the coasts of North and South America. Do you think this affects the risk from earthquakes to people in North and South America compared with Africa? Why?

Question 5 Using the procedures explained in Step 14, determine when (Year) and where (Country) the largest magnitude earthquake occurred?

Question 6 Where are the majority of the volcanoes in the world located in relationship to the plate boundaries? Why?

Question 7 Using the procedures explained in Step 14, determine which volcano is the highest in Africa (has the largest Elevation). Hint: Sort one of the fields in the Volcanoes Theme Table in descending order.

Think About Notice the location of volcanoes in Africa in relationship to the plate boundaries.

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URL:http://rockyweb.cr.usgs.gov/outreach/africa/act4.html
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